ONTARIO MINISTRY OF ENVIRONMENT
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1969

OPERATING SUMMARY

RICHMOND HILL

water pollution control plant

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1969

Richmond Hill : water pollution control plant.

81840

Water management in Ontario

Ontario
Water Resources
Commission

135 St. Clair Ave. W.
Toronto 195
Ontario

The operating efficiency and financial status of the water pollution control facilities operated for you in 1969 are presented in the following pages.

The regional operations engineer's comments and the statistical data will assist you in gauging the plant's level of performance. A new flow chart and up-to-date design data are also provided.

Various divisions and sections within the Commission have co-operated in providing what we trust is an accurate and concise annual operating summary.

D.S. Caverly,
General Manager.

D. A. McTavish, P. Eng.,
Director,
Division of Plant Operations.

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Toronto 7

RICHMOND HILL

water pollution control plant

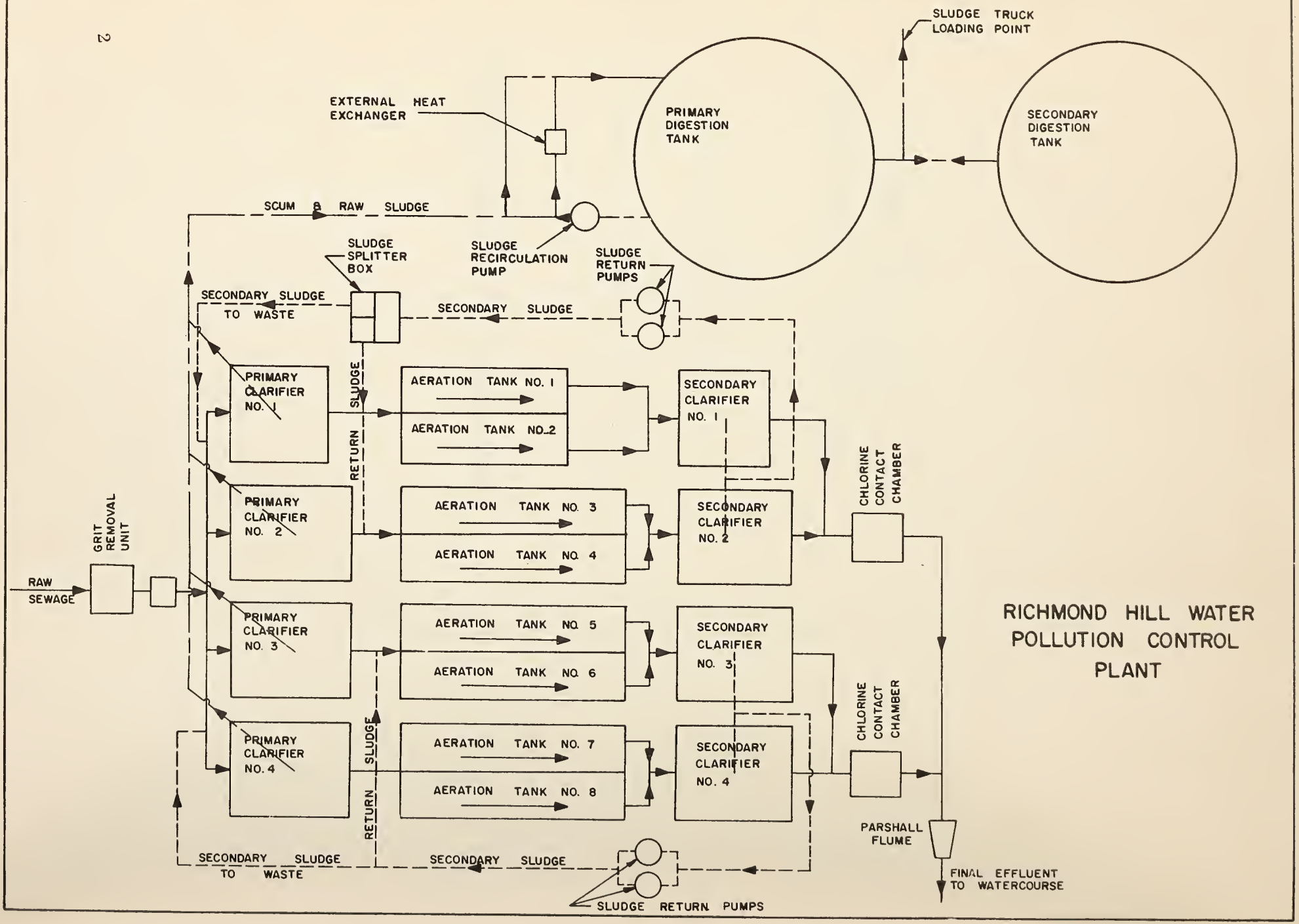
operated for

THE TOWN OF RICHMOND HILL

by the

ONTARIO WATER RESOURCES COMMISSION

1969 ANNUAL OPERATING SUMMARY


SLUDGE TRUCK LOADING POINT
EXTERNAL HEAT EXCHANGER
PRIMARY DIGESTION TANK
SECONDARY DIGESTION TANK
SCUM & RAW SLUDGE
SLUDGE SPLITTER BOX
SLUDGE RECIRCULATION PUMP
SLUDGE RETURN PUMPS
SECONDARY SLUDGE TO WASTE
SECONDARY SLUDGE
PRIMARY CLARIFIER NO. 1
SLUDGE
RETURN
AERATION TANK NO. 1
AERATION TANK NO. 2
SECONDARY CLARIFIER NO. 1
CHLORINE CONTACT CHAMBER
GRIT REMOVAL UNIT
RAW SEWAGE
PRIMARY CLARIFIER NO. 2
AERATION TANK NO. 3
AERATION TANK NO. 4
SECONDARY CLARIFIER NO. 2
PRIMARY CLARIFIER NO. 3
AERATION TANK NO. 5
AERATION TANK NO. 6
SECONDARY CLARIFIER NO. 3
CHLORINE CONTACT CHAMBER
PRIMARY CLARIFIER NO. 4
AERATION TANK NO. 7
AERATION TANK NO. 8
SECONDARY CLARIFIER NO. 4
PARSHALL FLUME
FINAL EFFLUENT TO WATERCOURSE
SECONDARY SLUDGE TO WASTE
SECONDARY SLUDGE
SLUDGE RETURN PUMPS
RICHMOND HILL WATER POLLUTION CONTROL PLANT

DESIGN DATA

PROJECT NO.	2-0006-57	TREATMENT	Activated Sludge
DESIGN FLOW	1.60 mgd	DESIGN POPULATION	16,000
BOD - Raw Sewage	200 mg/l	SS - Raw Sewage	220 mg/l
- Removal	90%	- Removal	95%

PRIMARY TREATMENT

Grit Removal

Type: Aerated
Size: One 15½' x 6' x 9' swd (5,220 gal)
Retention: 4.7 min

Primary Sedimentation

Type: Dorr
Size: One 16' dia x 10' swd
One 26' dia x 10' swd
Two 26' dia x 9.7' swd
(110,000 gal)
Retention: 1.65 hr
Loading: Surface, 908 gal/ft^2/day
Weir, 4880 gal/ft/day

SECONDARY TREATMENT

Aeration Tanks

Type: Diffused air; single-pass
Size: Two 58' x 9' x 9'
Two 81' x 14½' x 10¼'
Four 81' x 14½' x 9 1/3'
(482,700 gal)
Retention: 7.2 hr

Diffusers

- Carborundum diffusers

Air Supply

a) Type: Standaire (C.P.)
Size: One 400 scfm
Two 510 scfm

b) Type: Sutorbilt
Size: One 1,000 scfm

Secondary Sedimentation

Type: Dorr
Size: One 19' dia x 10' swd
One 30' dia x 10' swd
Two 30' dia x 9.7' swd
(147,180 gal)
Retention: 2.21 hr
Loading: Surface, 667 gal/ft^2/day
Weir, 4120 gal/ft/day

CHLORINATION

Type: W & T
Size: One 200 lb/day

Chlorine Contact Chamber

Size: Two 25' x 10' x 8' (25,000 gal)
Retention: 22½ min

OUTFALL

- to German Mills Creek

SLUDGE HANDLING

Digestion System - two-stage

Primary --
Type: Walker, 1 draft tube
Size: One 50' dia x 20' swd (39,200 ft^3 or 0.245 mil gal)

Secondary--
Type: Dorr (has one draft tube)
Size: One 30' dia x 19' swd (13,400 ft^3 or 83,500 gal)

'69 REVIEW

GENERAL

The Richmond Hill Water Pollution Control Plant is a secondary treatment plant with a design capacity of 1.6 mgd. The plant is operated by a staff of one chief operator and three operators. The average daily flow for the year was above the design capacity, and flows up to 3.0 mgd were given secondary treatment.

During the year the consulting firm of Hisey and Barrington was involved in preparing plans and specifications for a flow equalizing tank which will improve the treatment capacity of the plant.

The OWRC Research Division carried out plant-scale studies at the plant on the use of lime for removing phosphate. The study created much interest and was widely reported in the news media.

Work began on a digester cleanout and digester repairs during the latter part of the year.

EXPENDITURES

The cost of operating the plant in 1969 was $60,794.64. The cost per million gallons treated was $78.98 and follows the trend of decreasing unit costs of previous years as shown in the operating cost table.

PLANT FLOWS and CHLORINATION

A total of 769.70 million gallons was treated during the year. This represents an increase of approximately 9 percent over the 1968 flows and represents an average daily flow of 2.10 million gallons. The design flow of 1.60 million gallons was exceeded approximately 98 percent of the time and flows over 3.0 mgd were bypassed and chlorinated.

A total of 36,995 lbs. of chlorine was used for an average dosage of 4.8 mg/l for the year.

PLANT EFFICIENCY

The average strength of raw sewage in 1969 was 130 mg/l BOD and 177 mg/l suspended solids.

The average removal efficiencies of 89% for BOD and 92% for suspended solids resulted in a final effluent with an average concentration of 14 mg/l BOD and 14 mg/l suspended solids compared to the OWRC objective of 15 mg/l for each.

A total of 1139 cubic feet of grit was removed for an average of 1.48 cubic feet per million gallons treated. This amount of grit indicates that the sewer collection system is operating normally.

AERATION

The primary effluent had an average concentration of 73 mg/l BOD and 75 mg/l suspended solids. The aeration section mixed liquor suspended solids had an average concentration of 1153 mg/l. The average loading on the aeration section was 36 pounds of BOD per 100 pounds of MLSS, for a F/M ratio of 0.36. An average of 2,527 cubic feet of air was used per pound of BOD removed. The control of return sludge from the Nos. 3 and 4 final clarifiers was improved by converting a valve pit to a return sludge pit.

SLUDGE DIGESTION AND DISPOSAL

A total of 3.359 million gallons of raw sludge was pumped to the digester at an average solids concentration of 3.8 percent of which an average of 74 percent was volatile matter. A total of 2.489 million gallons of digested sludge was removed from the digester at an average solids concentration of 4.7 percent of which an average of 64 percent was volatile matter. Sludge disposal was by tank truck haulage.

CONCLUSIONS

The hydraulic load was consistently above the design capacity and the organic load was less than or near the design capacity. The average concentrations of BOD and suspended solids in the final effluent were within OWRC objectives of 15 mg/l for secondary treatment plants, although at times they exceeded these objectives.

Considering the loadings on the plant, it provided good treatment with an average of 89% reduction in BOD and 92 reduction in suspended solids.

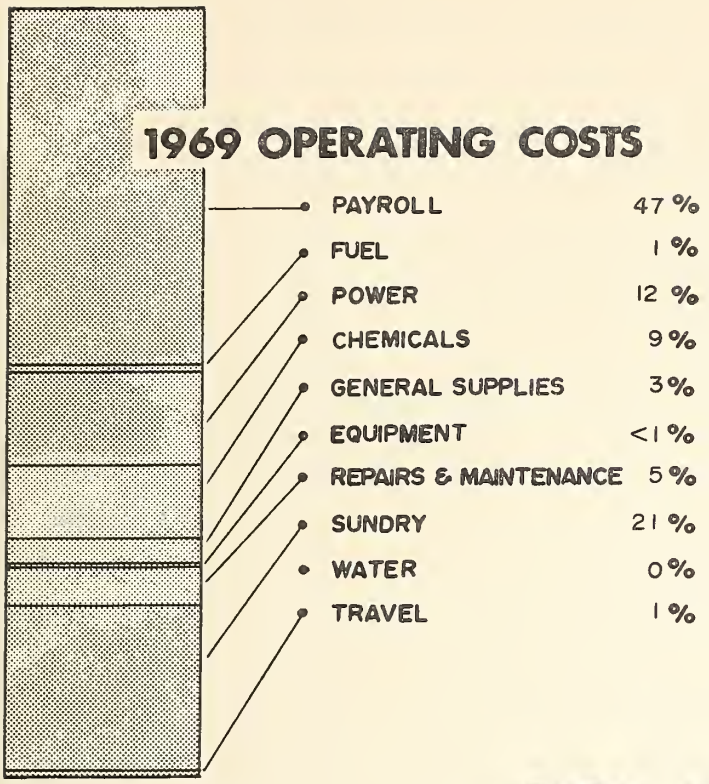
Flows which exceeded 3.0 mgd were by-passed and chlorinated. A new flow equalizing tank which will accommodate fluctuations of flow will improve the treatment capacity of the plant.

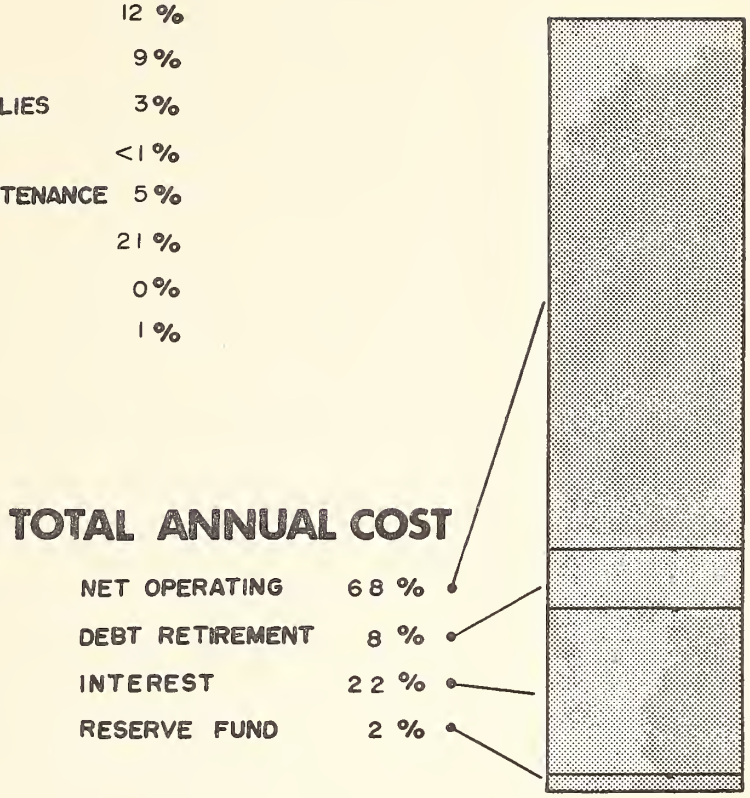
PROJECT COSTS

NET CAPITAL COST (Final) Long Term Debt to OWRC	$359,420.34
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1969	$108,706.10
Net Operating	$ 60,794.64
Debt Retirement	7,253.00
Reserve	1,983.12
Interest Charged	20,122.10
TOTAL	$ 90,152.86

RESERVE ACCOUNT

Balance @ January 1, 1969	$ 16,712.76
Deposited by Municipality	1,983.12
Interest Earned	991.32
	$ 19,687.20
Less Expenditures	-
Balance @ December 31, 1969	$ 19,687.20





Yearly Operating Costs

YEAR	MILLION GALLONS TREATED	TOTAL OPERATING COSTS	COST PER MILLION GAL	COST PER LB OF BOD REMOVED
1965	569.643	$50,984.00	$89.50	4 cents
1966	593.445	51,339.00	86.51	5 cents
1967	663.776	56,375.17	84.93	6 cents
1968	704.89	53,637.43	76.09	6 cents
1969	769.7	60,794.64	78.98	7 cents

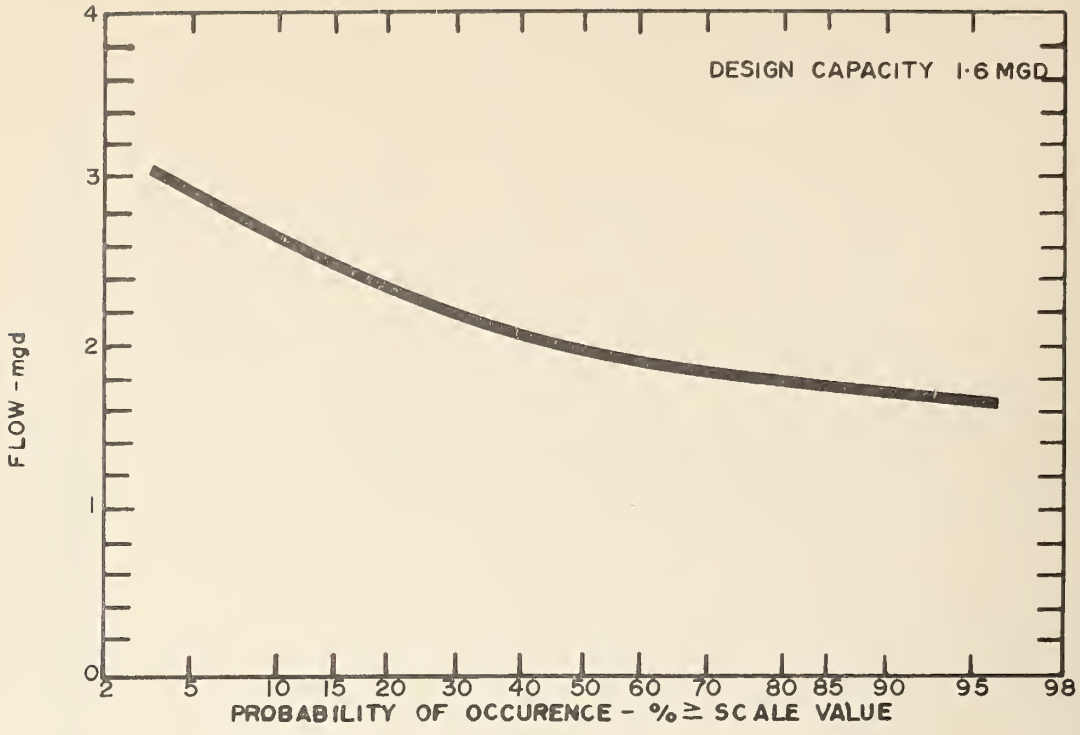
Monthly Operating Costs

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICALS	GENERAL SUPPLIES	EQUIPMENT	REPAIRS and MAINTENANCE	SUNDRY *	WATER	TRAVEL
JAN	3903.22	3114.90	-	136.05	585.89	(23.87)	60.20	-	-	30.05	-	-
FEB	5210.69	2119.75	-	104.99	536.81	715.83	144.20	16.75	418.68	1099.53	-	54.15
MAR	4790.87	2194.35	-	109.79	505.66	477.22	124.37	-	351.42	982.31	-	45.75
APR	14479.46	2670.42	-	140.91	-	238.61	185.54	(12.21)	174.30	1081.89	-	-
MAY	4421.88	2003.27	-	66.05	1315.99	441.00	163.87	-	299.15	99.40	-	33.15
JUNE	5939.73	2224.44	-	39.37	692.50	441.00	106.55	-	457.49	1959.78	-	18.60
JULY	4523.47	2167.89	-	25.40	569.23	441.00	48.05	188.96	67.24	984.95	-	30.75
AUG	6253.17	3288.43	451.15	32.30	630.13	330.75	153.75	36.32	226.30	1060.39	-	43.65
SEPT	5211.97	2242.35	18.09	272.35	581.92	771.75	112.36	-	-	1173.70	-	39.45
OCT	2997.54	1599.81	-	-	711.25	441.00	58.13	-	187.35	-	-	-
NOV	4691.51	2221.24	-	79.67	646.00	441.00	87.17	-	-	1152.23	-	64.20
DEC	8371.13	2892.12	-	(278.11)	647.92	661.50	362.78	-	753.40	3295.67	-	35.85
TOTAL	60794.64	28738.97	469.24	728.77	7423.30	5376.79	1606.97	229.82	2935.33	12919.90	-	365.55

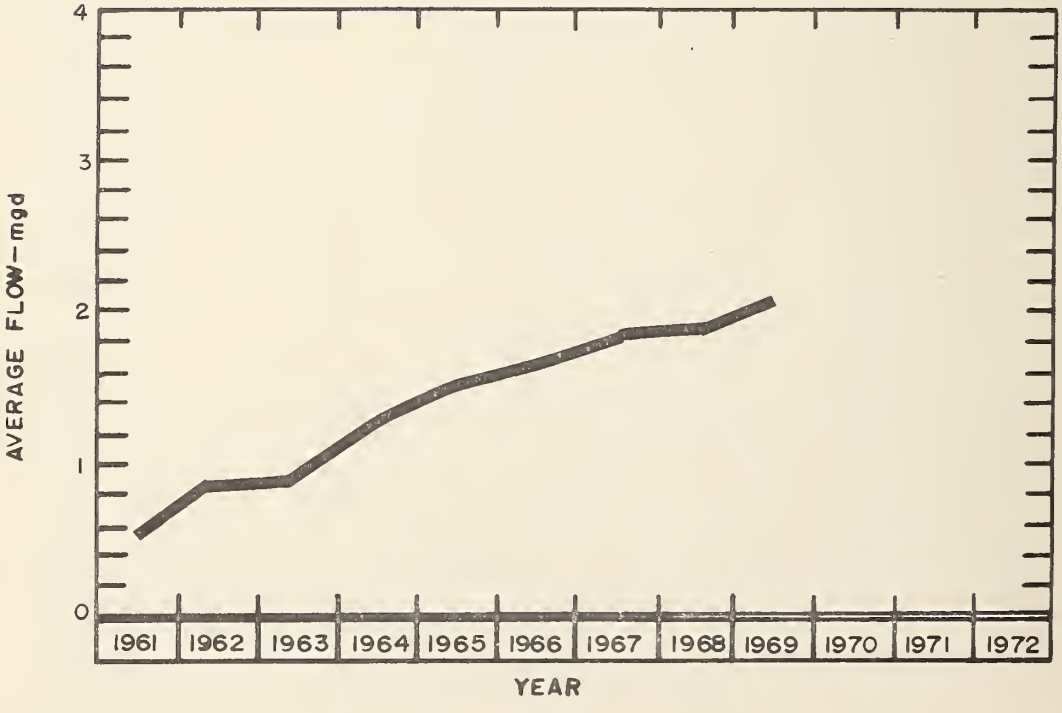
BRACKETS INDICATE CREDIT

* SUNDRY INCLUDES SLUDGE HAULAGE COSTS WHICH WERE $11,734.56

PROCESS DATA

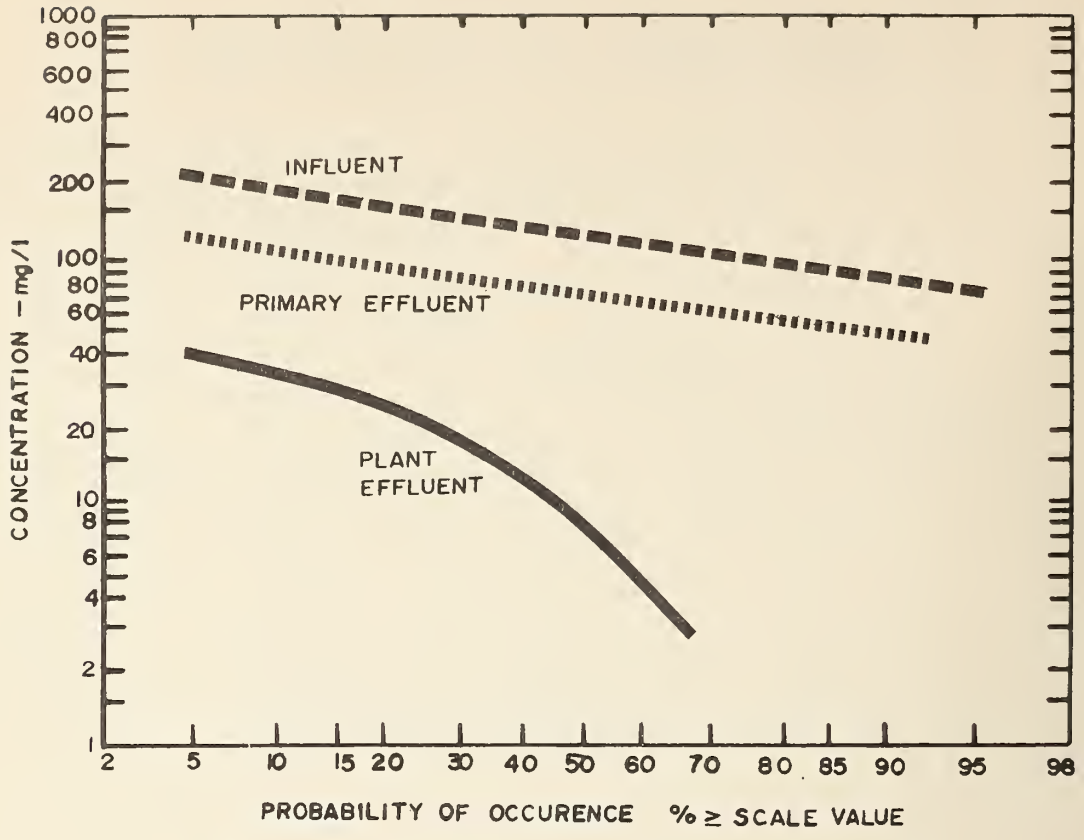

DESIGN CAPACITY 1·6 MGD
FLOW - mgd
0
1
2
3
4
2
5
10
15
20
30
40
50
60
70
80
85
90
95
98
PROBABILITY OF OCCURENCE - % ≥ SCALE VALUE

FLOWS

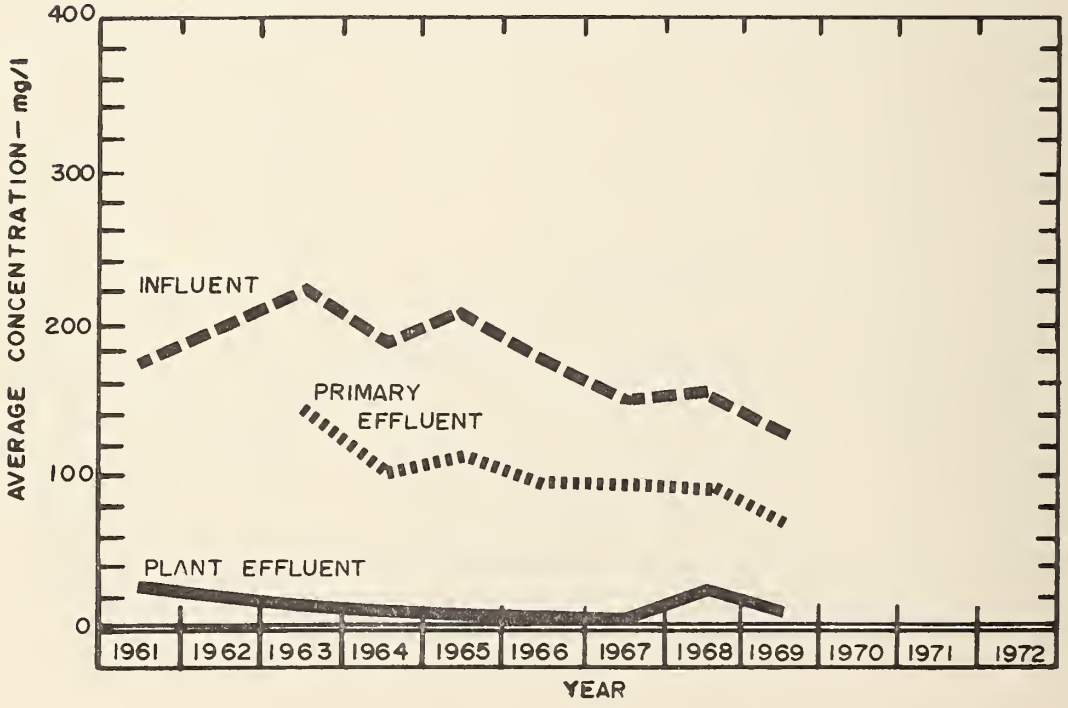

AVERAGE FLOW - mgd
0
1
2
3
4
1961
1962
1963
1964
1965
1966
1967
1968
1969
1970
1971
1972
YEAR

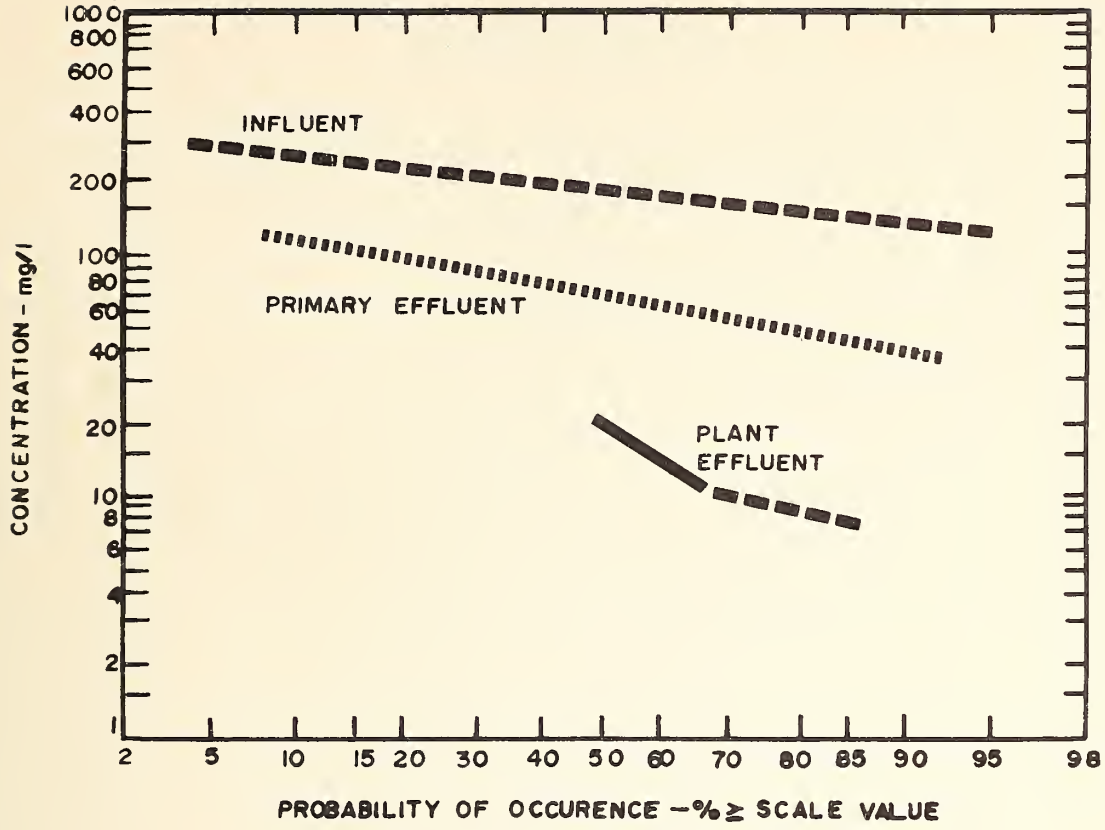
PLANT FLOWS and CHLORINATION

MONTH	TOTAL FLOW mil gal	AVERAGE DAILY FLOW mil gal	MAXIMUM DAILY FLOW mil gal	MINIMUM DAILY FLOW mil gal	CHLORINE USED pounds	DOSAGE mg/l
JAN	63.1	2.0	2.9	1.6	3015	4.8
FEB	49.4	1.8	2.3	1.5	2505	5.1
MAR	69.1	2.2	2.9	1.6	3030	4.4
APR	81.5	2.7	3.0	2.4	3055	3.7
MAY	77.5	2.5	2.9	2.2	3050	3.9
JUNE	65.3	2.2	2.5	1.8	2810	4.3
JULY	62.1	2.0	2.2	1.8	3215	5.2
AUG	57.6	1.9	2.2	1.2	3165	5.5
SEPT	56.9	1.9	2.1	1.7	3195	5.6
OCT	59.1	1.9	2.4	1.6	3285	5.6
NOV	63.8	2.1	2.7	1.9	3300	5.2
DEC	64.3	2.1	2.6	1.8	3370	5.2
TOTAL	769.7	-	-	-	36995	-
AVERAGE	-	2.1	-	-	3083	4.8

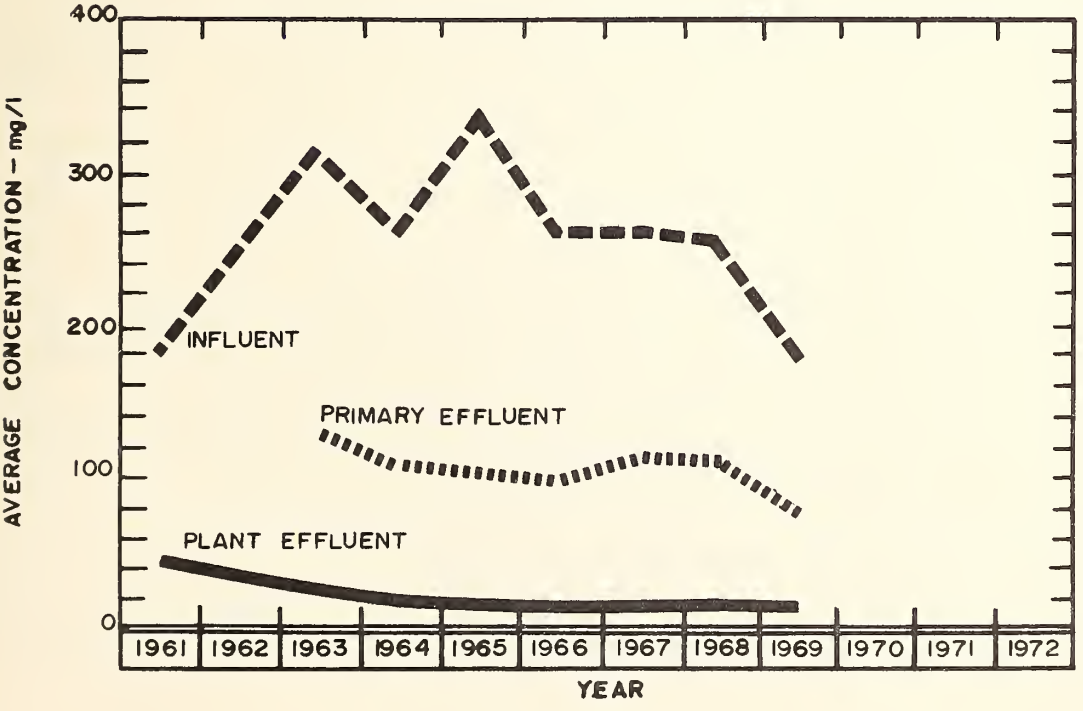


BIOCHEMICAL OXYGEN DEMAND





SUSPENDED SOLIDS

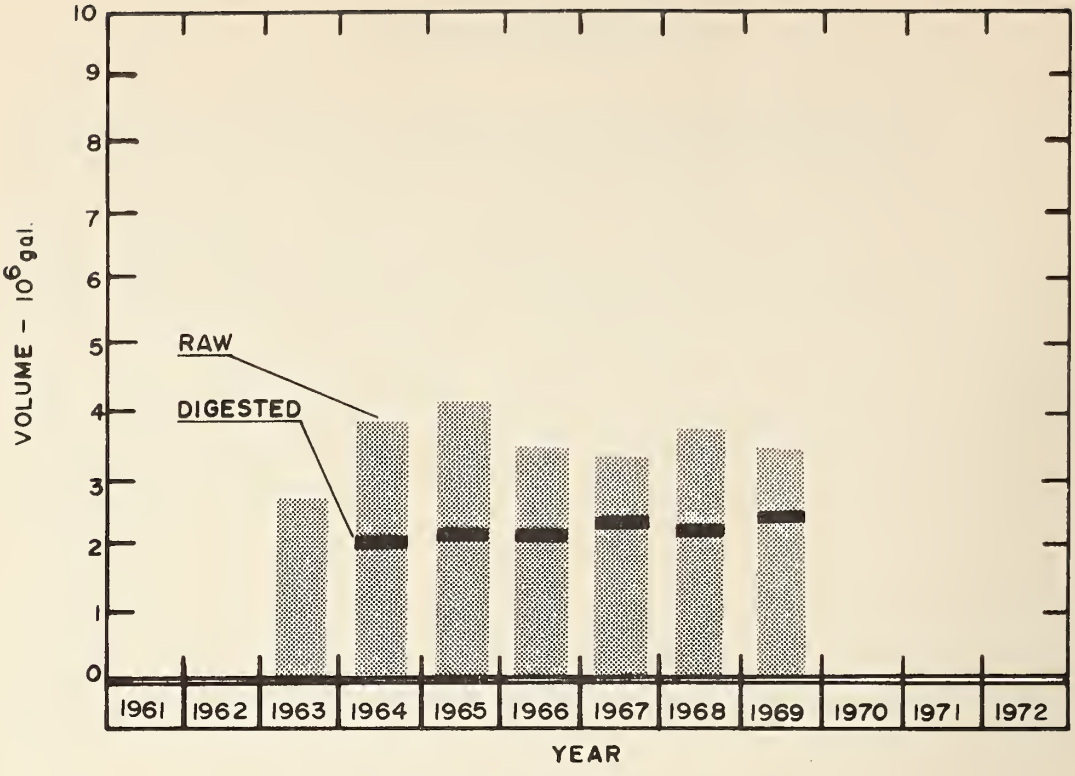


PLANT EFFICIENCY

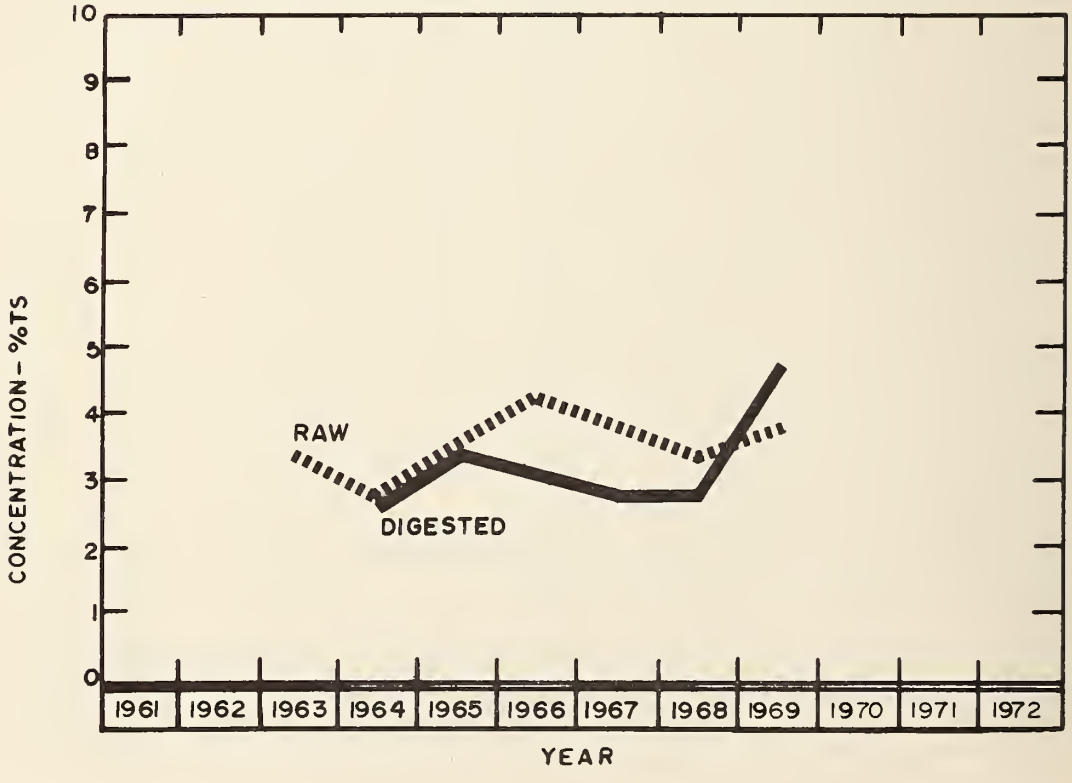
MONTH	BIOCHEMICAL OXYGEN DEMAND				SUSPENDED SOLIDS				GRIT REMOVAL
	INF.	EFF.	REDUCTION		INF. CONCN	EFF. CONCN	REDUCTION		
	mg/l	mg/l	%	10^4 pounds	mg/l	mg/l	%	10^4 pounds	cu ft
JAN	180	19	89	10.1	290	20	93	17.0	89
FEB	110	18	84	4.6	140	20	86	5.9	57
MAR	110	24	78	5.9	170	20	88	10.3	90
APR	100	19	81	6.6	150	20	87	10.6	79
MAY	80	11	86	5.4	110	20	81	7.0	102
JUNE	130	38	71	6.0	140	10	92	8.5	98
JULY	150	5	97	9.0	170	5	97	10.2	86
AUG	117	5	96	6.4	210	5	98	11.8	90
SEPT	130	8	94	6.9	140	5	96	7.7	106
OCT	220	5	98	12.7	250	10	96	14.2	107
NOV	100	6	94	6.0	180	20	89	10.2	114
DEC	-	-	-	-	-	-	-	-	121
TOTAL	-	-	-	-	-	-	-	-	1139
AVERAGE	130	14	89	6.7	177	14	92	9.4	94

AERATION

MONTH	AVG DAILY FLOW mil gal	AERATION INF. BOD mg/l	AERATION INF. SS CONCN mg/l	SECONDY. EFF. BOD mg/l	SECONDY. EFF. SS CONCN mg/l	M L S S CONCN mg/l	F/M lb BOD / lb MLSS	AIR USED 1000 cu ft / lb BOD
JAN	2.0	55	70	19	20	1030	.27	3.64
FEB	1.8	80	60	18	20	930	.38	2.34
MAR	2.2	65	70	24	20	966	.38	2.92
APR	2.7	34	40	19	20	968	.60	1.48
MAY	2.5	70	100	11	20	1365	.32	1.91
JUNE	2.7	75	70	38	10	1283	.31	3.92
JULY	2.0	100	110	5	5	1193	.41	1.79
AUG	1.9	68	80	5	5	1161	.27	2.91
SEPT	1.9	75	65	8	5	1253	.28	2.67
OCT	1.9	120	80	5	10	1203	.47	1.56
NOV	2.1	65	80	6	20	1204	.29	2.66
DEC	2.1	-	-	-	-	1275	-	-
TOTAL	-	-	-	-	-	-	-	-
AVERAGE	2.1	73	75	14	14	1153	.36	2.53


VOLUME - 10^6 gal.
10
9
8
7
6
5
4
3
2
1
0
RAW
DIGESTED
1961
1962
1963
1964
1965
1966
1967
1968
1969
1970
1971
1972
YEAR

DIGESTION


CONCENTRATION - %TS
10
9
8
7
6
5
4
3
2
1
0
RAW
DIGESTED
1961
1962
1963
1964
1965
1966
1967
1968
1969
1970
1971
1972
YEAR

SLUDGE DIGESTION and DISPOSAL

MONTH	RAW SLUDGE			DIGESTED SLUDGE			SUPERNATANT		SLUDGE DISPOSAL	
	VOLUME 10^4 gal	TOTAL SOLIDS %	VOL SOLIDS %	VOLUME 10^4 gal	TOTAL SOLIDS %	VOL SOLIDS %	VOLUME 10^4 gal	TOTAL SOLIDS %	DEWATERED cu yd	LIQUID cu yd
JAN	27.8	2.4	79	18.4	3.2	59	-	-	-	1090
FEB	20.7	3.9	76	17.4	5.8	56	-	-	-	1032
MAR	28.3	7.4	-	18.0	19.8	-	-	-	-	1068
APR	25.3	3.3	69	17.2	5.9	76	-	-	-	996
MAY	26.7	5.0	-	20.6	1.6	-	-	-	-	1224
JUNE	26.4	2.5	-	18.6	3.7	-	-	-	-	1104
JULY	28.0	4.0	-	20.0	2.4	-	-	-	-	1188
AUG	29.5	3.1	-	22.2	3.1	-	-	-	-	1320
SEPT	30.2	3.7	-	19.8	3.2	-	-	-	-	1176
OCT	30.2	4.4	-	28.5	2.1	-	-	-	-	1692
NOV	29.0	2.3	-	22.8	1.1	-	-	-	-	1356
DEC	33.8	-	-	25.4	-	-	-	-	-	1512
TOTAL	335.9	-	-	284.9	-	-	-	-	-	14758
AVERAGE	28.0	3.8	74	20.7	4.7	64	-	-	-	1229

Date Due

AUG - 6 1971

Water management in Ontario